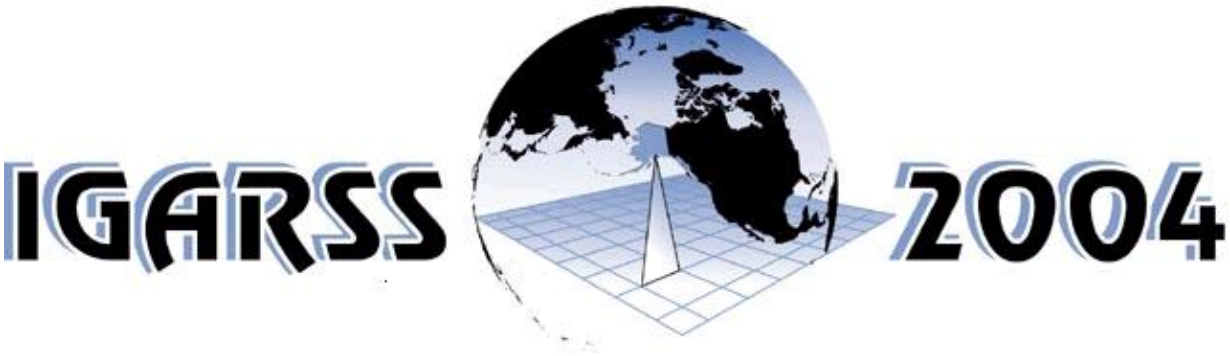

20-24 September 2004
Anchorage Alaska

MERGING THE MODIS AND RUCL MONTHLY SNOW-COVER RECORDS

Dorothy K. Hall*, James L. Foster**, David A. Robinson+ and George A. Riggs++
*Oceans and Ice Branch, Code 971, **Hydrological Sciences Branch, Code 974, NASA/Goddard Space Flight Center, Greenbelt, MD 20771 Dorothy.K.Hall@nasa.gov, James.L.Foster@nasa.gov
+Rutgers University, Piscataway, NJ 08854 drobins@rci.rutgers.edu
++Science Systems and Applications, Inc., Lanham, Maryland 20706 griggs@glacier.gsfc.nasa.gov

***Abstract*–Monthly time series from two satellite snow-cover records are merged to study the construction of a climate-data record for the Northern Hemisphere, and its limitations.**

I. INTRODUCTION AND BACKGROUND

A. Snow-cover mapping of the Northern Hemisphere

Satellite-derived maps of snow cover for the Northern Hemisphere have been generated using a variety of satellites, sensors and techniques. NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) began to generate Northern Hemisphere Weekly Snow and Ice Cover analysis charts in November 1966 using manual techniques from NOAA satellite data, at a spatial resolution of 190 km. Since 1997 the Interactive Multi-Sensor Snow and Ice Mapping System (IMS) has been used by NESDIS analysts to produce products daily at a spatial resolution of about 25 km, utilizing a variety of satellite data [1]. This snow-cover record has been studied carefully [2], [3] and has been reconstructed by the Rutgers University Climate Lab (RUCL) using adjustments for inconsistencies that were discovered in the early part of the data set [4], [5]. Results show that the Northern Hemisphere annual snow-covered area has decreased [2], [6], [7], [8], [9], [5], [10] about 0.2% per year from 1978 - 1999 [9].

With the launch of NASA's Earth Observing System (EOS) Terra satellite, snow maps have been produced globally, using automated algorithms, on a daily and 8–day composite basis from the Moderate-Resolution Imaging Spectroradiometer (MODIS) instrument since February 24, 2000. The MODIS snow products http://modis-snow-ice.gsfc.nasa.gov, are provided at a variety of different resolutions and projections to serve different user groups [11] and [12]. In the near future, monthly MODIS snow products will also be produced automatically.

The period of overlap of the MODIS and RUCL monthly snow maps, March 2000 to the present, presents an opportunity to compare the maps with the intent of producing a climate-data-record (CDR) quality product for the Northern Hemisphere. In this paper, we explore some of the problems and limitations of this process.

IV. DISCUSSION AND CONCLUSION

In this limited and preliminary study, we have shown that the maps are very similar in terms of the extent of snow cover. In September and October 2003, the buildup of snow cover can occur rapidly, and since different algorithms are used to map monthly snow cover, differences in the areal extent of snow mapped are more likely. When new snow falls near the end of the month, and if clouds do not clear until early the following month, then the MODIS algorithm will not map snow in those cells obscured by clouds.

As the length of the satellite record increases through the MODIS era, and into the National Polar-Orbiting Environmental Satellite System (NPOESS) era, it should become easier to identify trends in areal extent of snow cover, if present, that may have climatic significance. Thus it is important to study the validity of merging the NESDIS and MODIS, and, in the future, the NPOESS snow datasets for determination of long-term continuity in measurement of Northern Hemisphere, and ultimately, global snow cover. In this preliminary study, we have identified some of the issues relating to comparing two snow-cover data sets. A continuation of this work is planned when a longer monthly snow-cover record from MODIS can be utilized.